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A SUMMARY OF THE STUDY INVESTIGATING THE SUCCESS OF THE INNOVATIVE HOUSING GRANTS PROGRAM FROM AN INVESTMENT PERSPECTIVE

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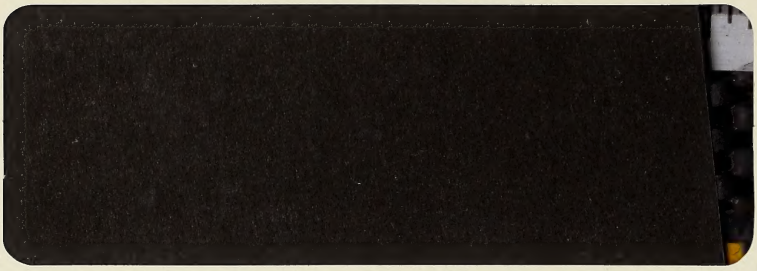
Alberta
MUNICIPAL AFFAIRS
Housing Division



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Completed by:

Lorand Consulting Inc.
22 Varshaven Place N.W.
Calgary, Alberta T3A OE1
(403) 288-2694

Completed for:

Grants and Technical Support Branch
Housing Division
Alberta Municipal Affairs

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A SUMMARY OF THE STUDY INVESTIGATING THE SUCCESS OF THE INNOVATIVE HOUSING GRANTS PROGRAM FROM AN INVESTMENT PERSPECTIVE

I. CONCLUSIONS AND RECOMMENDATIONS OF THE STUDY

From an investment perspective, the IHGP has much more than paid for itself. Benefits resulting from even the limited number of projects examined far exceed the cost of the IHGP. Table 1 shows that the total net benefit to date to Alberta alone from the projects examined is conservatively estimated at $59.5 million. Over $18.5 million of this should be attributed to the IHGP. From April 1982 to March 1991 (the period examined) IHGP grant and administrative expenditures totalled only $8.1 million. The entire cost of the Innovative Housing Grants Program from its start in 1978 to date is less than $10 million.

One of the reasons that the IHGP is so cost effective can be traced to the way in which the Program conducts its business. By working so closely with industry, the Province does not pay the full cost of introducing most of the innovations that are funded. The proponent's investment almost always equals or exceeds the amount of the grants awarded.

TABLE 1: A SUMMARY OF COSTS AND BENEFITS ASSOCIATED WITH THE INNOVATIONS THAT WERE EXAMINED

	$
AMOUNT OF IHGP SUPPORT (1)	931,695
TOTAL NET BENEFIT TO ALBERTA (2)	59,472,910
NET BENEFIT ATTRIBUTABLE TO IHGP (3)	18,576,740
PRESENT VALUE OF NET BENEFIT (4)	20,297,900

(1) This includes grant expenditures plus distribution, manpower and administration costs.
(2) This excludes consideration of IHGP costs or other government grants and **excludes estimated future benefits.**
(3) This is the net gain attributable to the IHGP after deducting all IHGP costs and other government grant costs.
(4) This is expressed in 1991 dollars.

Even with costs and benefits adjusted to a present value basis the net economic benefits of the Innovative Housing Grants Program are considerable. Indeed, the net benefit of several of the innovations studied is somewhat higher when expressed in 1991 dollars than when expressed in non-discounted dollars.

Nearly all of the innovations examined appear to be economic as well as technical successes. Increased market penetration and growth is projected for most other innovations, and in many cases increased export activity is forecast as part of the market penetration expected. Several of the proponents are in the midst of negotiating distribution rights and export contracts to other major jurisdictions including Japan and the United States.

Several of those interviewed cited the reputation of IHGP (and consequently Alberta) as a center for housing innovation as being a significant factor that opened doors to export activity. IHGP has enhanced the reputation of the Province as a center for housing information in Canada and internationally. As a consequence, Alberta is now being taken more seriously by some potential trade partners.

Benefits resulting from the projects examined (which are summarized in Table 1) are significantly understated in most instances. This is true for several reasons. First, it is not possible to properly capture a number of qualitative benefits and costs in the economic approach that was used. In many cases these qualitative benefits are very significant. Second, this analysis was limited to examining benefits that accrue directly to Alberta. In most cases technology transfer extends beyond provincial borders. This has meant that the housing industry in the rest of the country and in the United States has also benefited from IHGP work. Third, most of the innovations studied are not yet fully commercialized. They are relatively new ideas and have not yet fully penetrated their markets. In the early years of an innovation development costs typically exceed revenue, and this study has <u>not</u> projected future revenues for the innovations examined. Assuming economic conditions do not deteriorate, if the analysis were completed two years or so from now benefits would have escalated significantly. Fourth, when choices in the analysis could result in presenting either a more favourable picture of the impact of the IHGP or a less favourable scenario, the latter was normally chosen; the resulting estimates were therefore conservative.

The proportion of the project benefit attributable to IHGP was dependent on the judgement of proponents. However, it must be noted that the numbers they provided were not taken at face value. The process involved significant discussion with proponents about the rationale for their weightings. Proponents were challenged and numbers

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were cross-referenced to get as reasonable an estimate as these informed participants could provide. While it is possible that some of the proponents were generous in attributing IHGP's share of the consequences of an innovation (be these benefits or costs), other inventors were less than generous when crediting the contribution of factors (including factors relating to IHGP) beyond their own ingenuity and effort.

Certain critics might argue that some developments funded by IHGP would have occurred without funding. There is, in fact, no way of knowing for sure whether this is true. However, many proponents argue that they would not have proceeded without the grants they received and the associated assistance from IHGP staff. Others argue that developments would have been delayed significantly and/or not handled as well or as comprehensively. Much of the success of innovations can be traced to proper planning from the inception of an idea. Many proponents did not know how to do part or all of this and consequently relied very heavily on IHGP expertise. Indeed, some could now benefit from further marketing assistance to help them maximize the potential benefits of their innovations.

Some might also argue that the innovations studied were not fully representative of the range of projects carried out under the Innovative Housing Grants Program. This is correct; the cost-benefit methodology used is more suited to some types of IHGP projects than others, and further reviews of other innovations are planned. However, even under the far-fetched scenario of all other IHGP projects being losers - with no economic gain to offset their costs - this study has shown that the innovations examined here were more than enough to justify the costs of the entire program to date.

There is no doubt in the author's mind that the Innovative Housing Grants Program should be continued. The Program represents exceedingly good value for money. Projects that are funded contribute to the economic base of the Province and the viability of the housing industry; consumers benefit from better built, lower priced homes. Introduction of new technology into housing may well be the key to players in that industry achieving and maintaining Alberta's competitive advantage. The importance of industry becoming more involved with new technologies is continually cited by the Economic Council of Canada as one of the most pressing problems facing the Canadian economy today. The margins that many builders enjoy are small, and in some cases it is difficult to know how these companies keep their doors open. Use of more cost-effective technologies can make a significant difference. Accordingly, there will be a continuing need for the type of industry support that the Innovative Housing Grants Program provides.

II. CONTEXT OF THE REVIEW

The Innovative Housing Grants Program (IHGP) has been active in research, development and technology transfer for over a decade. The rationale for the Program has always been clear:

* that housing research and development generates new ideas which improve housing and advance the industry;
* that the housing industry under-invests in research and development for legitimate and well-recognized reasons; and
* that the Program offsets this under-investment and yields intended qualitative and economic benefits.

Treasury Board cut the Program budget significantly from $600,000 in 1990/91 to $200,000 in 1991/92. The Housing Divisions of Alberta Municipal Affairs support IHGP and obtained approval to supplement that budget with funds from other budgets in 1991/92. However, this approach is neither desirable nor feasible on an ongoing basis. Concerns led to questions about whether the IHGP should be continued. An important factor to consider was whether intended benefits have been realized.

Although the Department had conducted a few studies of Program impacts in the past and these were positive, they had not quantified benefits and costs. Therefore, in the summer of 1991 the Department worked with Lorand Consulting Inc. to develop an approach to assess the economic benefits and costs of the IHGP and to test this methodology in a pilot study. The results were quite positive. Therefore, as part of the process of assessing the Program, the Grants and Technical Support Branch engaged Lorand Consulting to use the methodology to assess the costs and benefits of a sample of IHGP projects to give a better indication of the Program's economic benefits.

III. RESEARCH OBJECTIVES

The main objective of the study was to assess the costs and benefits of selected IHGP projects. On the basis of this assessment, the Consultant was to draw some conclusions about whether the Program should be continued.

IV. DESCRIPTION OF THE METHOD USED TO ASSESS PROJECTS IN THE CURRENT STUDY

This study focused on economic results of IHGP. In this context, funding for IHGP grants and administration can be viewed as venture capital that the Alberta government has invested into the Alberta economy. The payback of the investment can be considered in terms of whether the social and economic benefits of projects that have been funded outweigh the costs associated with them. The pertinent issue regarding the wisdom of future investment becomes whether there are likely to be social and economic benefits if the Province continues to fund IHGP. One way of examining this is to consider past Program achievements and ask whether government funding of housing research and development has been historically worthwhile. In other words, were the net benefits worth the costs?

As indicated earlier, in preparation for tackling that question, a method for analyzing the cost effectiveness of IHGP projects was developed and tested on a small sample of completed IHGP projects. This study extended that methodology to a larger number of IHGP projects.

Proponents of the IHGP projects included in the study were asked to participate by the Director of Research and Technical Support. All agreed. Subsequently, each was contacted by the consultant who set up an interview date and sent each a letter and a copy of a cost-benefit analysis worksheet to complete in preparation for the interview. The worksheet was reviewed in a personal or telephone interview at which time other questions were asked.

After each interview, detailed notes and a spreadsheet calculating costs and benefits were prepared and sent back to the proponents for comment. Outstanding questions were identified in a covering letter and proponents were asked to clarify issues requiring resolution. In almost all cases proponents provided feedback over the telephone after which required changes were made and data was finalized. Commitments were made to maintain the confidentiality of financial information because some of this information could damage the business positions of the proponents if released.

A. THE MODEL

There are many qualitative benefits and costs associated with the projects that have been identified before. Current interest is in economic cost/benefit factors, and the task was therefore to focus on economic benefits that could be quantified. The following model was used to calculate a net benefit or cost for each of the projects selected.

Net benefit of selected IHGP projects = **a (b + c) - d**, where

"**a**" is the proportion of total benefit accruing from the project that is attributable to IHGP and related support,

"**b**" is the net gain to the proponent due to the project results,

"**c**" is the net gain to the rest of Alberta society that is attributable to the project, and

"**d**" is the total cost of the IHGP project to government.

1. CALCULATION OF THE PROPORTION OF THE BENEFIT ACCRUING TO IHGP ("a")

Only the benefits considered to result from IHGP efforts were used to offset government costs. The relevant proportion for a given project was identified by the proponent(s) of that project.
To prepare proponents to assign a percentage, each was first asked to rate the contribution of the IHGP to the success of his project on a five-point semantic differential scale with the anchors at each end being extremely important and not very important. Proponents then had to indicate whether their project would have proceeded without IHGP support. At that point, they were asked to consider the financial and other assistance that IHGP provided and indicate the percentage of the total benefit accruing from their project that they would attribute to IHGP and its related activities.

Proponents were told to consider a value of 0 as meaning that they believed none of the benefit accrued to IHGP or that the role the Program played was irrelevant. A value of 100% was described as indicating that all of the benefits should be attributed to IHGP or that the project could not have been completed without IHGP support. A

sensitivity analysis of the percentages assigned by proponents was completed for each project.

An alternative way of measuring the proportion of specific project benefits that should be attributed to IHGP would be to calculate the percentage of development costs that were paid by government and assume that proportion to represent involvement. This method was not considered to be a valid measure because many proponents cited less tangible contributions of the IHGP as the ones that made the most difference. For instance, many said that they learned to manage a project from IHGP staff or that by being involved with the Program they were forced to follow a structured process and adhere to time lines that later meant success of the innovation.

2. CALCULATION OF THE NET BENEFIT TO THE PROPONENT ("b")

The net benefit to the proponent was defined as income received from commercializing the innovation. The contribution margin of an innovation was considered equivalent to proponent profit in companies that produced more than one product or rendered other services. This was done to separate financial gains from each product from the bottom line of multiple service/product companies. Company overhead allocated to producing a product or service was deducted in the process of calculating a contribution margin.

Originally an attempt was made to quantify less tangible benefits (for example, labour saved) and to add this to income. Such items proved difficult to quantify in the time allocated for the project. Consequently, the definition of net benefit to the proponent was narrowed to become an income measure. Hence, in most cases, benefits reported are conservative estimates.

3. CALCULATION OF THE NET GAIN TO THE REST OF ALBERTA ("c")

Money spent in Alberta to produce each innovation was considered to be one of the components of net gain to the rest of Alberta. This was calculated by deducting the cost of purchasing services and supplies outside of Alberta from operating costs.

When possible other qualitative gains to Alberta were quantified and added to the production-oriented benefit calculation. However, in most cases this was not possible due to time and data restrictions. As a result, estimates can once again be viewed as conservative.

Export and domestic sales were not distinguished when calculating the net benefit figure. However, actual and potential exports are discussed in the reviews of individual projects.

4. CALCULATION OF THE TOTAL COST OF THE PROJECT TO GOVERNMENT ("d")

The cost to government was calculated as the sum of all grant monies the proponent received from both the provincial and federal government plus an overhead figure for IHGP involvement, including technology transfer activities (for example, the cost of printing and disseminating project documents).

The cost-to-government calculation does not consider administrative expenses incurred by bodies other than the Research and Technical Support Section. While this may be a significant factor for innovations funded by other federal or provincial agencies as well as IHGP, this information was not generally available.

B. STRENGTHS AND LIMITATIONS OF THE MODEL

1. STRENGTHS

While it is usual for grant programs to be evaluated by considering the economic, social and political significance of contributions, it is less usual for these to be quantified. Costs and benefits are more commonly described and weighed against one another in a qualitative argument. Comparison of costs to benefits is difficult as units of measurement are not standard. For example, we may consider dollars spent on administration versus number of people placed in housing units or grants expended versus obtaining an improvement in home construction.

The cost-benefit methodology employed attempts to describe both costs and benefits in terms of a common measure - dollars and cents. This standardizes comparison. To the extent that different inputs, outputs and social objectives can be measured in terms of money, cost-benefit analysis reduces the problem of considering trade-offs between objectives and projects to a numeric one. This standardization facilitates analysis both within and between projects.

Completing a cost-benefit analysis also yields valuable information that might not otherwise be apparent. It generally leads to a clearer appreciation of subject matter.

2. LIMITATIONS

Costs and benefits associated with IHGP are both qualitative and quantitative. Innovations have resulted in social and economic gains and costs. Hence, neither the costs nor the benefits associated with projects can be completely quantified. It is also difficult to count spin-off benefits and costs of increasing technological knowledge and development. Employing a strictly black and white quantitative cost-benefit analysis causes some of the subtlety and colour of a qualitative argument to be lost. To overcome some of these limitations the qualitative costs and benefits are generally identified for the projects considered.

At times, it can be difficult to obtain objective comparable numbers. For example, in this work, the proportion of project benefits attributable to IHGP is a fraction assigned by the proponents of the projects. Proponents will weigh IHGP contributions differently. Some will be more objective than others. The number is not perfect, rather it is a 'best estimate'.

Not all benefits, costs or social objectives can be measured in terms of money. For example, it is difficult to translate 'superior performance', 'better appearance', 'structurally superior', 'higher degree of comfort', 'improved sound insulation', 'reduced draughts' or even 'less expensive to operate' into specific financial terms. The methodology was also limited by the newness of some of the innovations which resulted in some of the products not having all of their advantages and disadvantages identified and quantified. It typically takes three or four years for an innovation to move to the commercialization stage. After that, time is required before full market penetration is reached. Most projects were examined prior to that penetration point.

Moreover, cost-benefit analysis is better suited to some types of IHGP projects than others. For instance, it works well for projects that involve development of new products and less well for many building design or educational applications. It also becomes more difficult to apply the methodology to cost-avoidance projects rather than cases where products, designs or services are used. In cost-avoidance situations much of the analysis is based on 'what-if' assumptions. An example would be the evaluation of the performance of attic radiant barriers which concluded that there was little advantage to using the technology in Alberta. In this case, a large number of Albertans saved installation costs.

In the detailed cost benefit analysis carried out on individual

innovations, development costs were deducted when calculating net benefits. This was done because it could not be clearly established that using these resources on different innovations might not have been an equally productive investment. However, the costs of Alberta inputs (whether goods or services) incurred in producing the resulting products or services commercially were considered to be a benefit to the Alberta economy because of the unused capacity in the Province in last decade.

Typically, cost-benefit program evaluation does not establish causality. It could be argued that benefits or losses may have occurred regardless of IHGP intervention. The cost-benefit method used attempted to surmount this difficulty by having proponents indicate the degree to which IHGP was responsible for outcomes.

C. PROJECT SELECTION

Projects were selected in consultation with the Director of the Research and Technical Support Section. Projects were chosen that reflected different degrees of success and that were carried out in different time periods. Recent projects were picked to indicate the current focus of the Program and older ones were chosen to enable more complete demonstration of impacts. Priority was given to selecting projects that had reasonably measurable results. An effort was also made to include some of the Program's more important projects.

The 12 innovations and 23 projects that were included in the study were:

* Airtight Drywall Approach (seven studies),
* Evaluation of the Performance of Attic Radiant Barriers,
* The Copper-Mate Plumbing Machine (two studies),
* Exterior Wall Opening Cover,
* Homesharing: A Housing Alternative for Seniors (2 studies),
* The NASCOR Wood "I" Floor Joists,
* Poly Air Dam Development (three studies),
* Development of a PVC Folding Door Using Alberta Technology and Materials,
* Spray Applied Cellulose Insulation Development (2 studies),
* Development of The 7S-3000 Stressed Skin Panel Building System,
* Tie Support System for Insulated Masonry Veneer Construction, and
* Development of the TTS Wood "I" Floor and Roof Joist System.

The projects that were selected do <u>not</u> represent all types of activity carried out under IHGP; many projects are not amenable to the type of economic analysis completed. Table 2 illustrates the distribution of the innovations chosen by type of project.

TABLE 2: IHGP INNOVATIONS AND PROJECTS SUBJECTED TO COST-BENEFIT ANALYSIS BY PRIORITY AREA

DESCRIPTION	# OF INNOVATIONS EXAMINED	# OF IHGP PROJECTS INVOLVED	COMPLETED PROJECTS (1978 to 1991)	
			#	%
Building Design	0	0	22	9.7
Construction Technology	4	13	60	26.7
Energy Conservation	0	0	15	6.6
Site Design	0	0	16	7.0
Site Servicing	0	0	5	2.2
Building Products	6	8	28	12.4
Information Technology	0	0	11	4.9
Education	0	0	12	5.3
Other	2	3	57	25.2
TOTAL	12	23	226	100.00

Further work is planned to examine the costs and benefits of other types of projects (e.g., building design) despite the difficulty of quantifying the economic benefits of some types of innovations.

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